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FY05 Xradia 3D (mu)XCT System Accomplishments

H. E. Martz, Jr., W. D. Brown

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Disclaimer

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Harry E. Martz, Jr. and William D. Brown
Lawrence Livermore National Laboratory
Livermore, CA 94551
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The Xradia 3D μXCT system was delivered to LLNL on April 5, 2005. The system became operational the week of April 11, 2005. The Xradia 3D μXCT system has been extensively used to scan several high-energy density physics (see Table 1) and other programmatic (NIF, E&E and DNT) materials, components and full assemblies. In this summary we only focus on the HEDP program. X-ray radiographs and tomograms of materials such as aerogel foams and gradient density reservoirs are being used to better understand material synthesis. Radiographs and tomograms of components include a glass capsule encapsulated within a 50-mg/cm^3 SiO_2 aerogel foam and then machined to final outer dimensions, while full up assemblies include low-temperature Raleigh-Taylor (LoTRT) [*Brown, et al. 2005*] and DDP targets.

We highlight two full up assembled targets: DDPs and LoTRTs. Representative X-ray digital radiographs are shown in Figures 1 and 2 for the DDP and LoTRT, respectively. The examples very clearly show that the assemblies were performed correctly.

Table 1 HEDP targets and dates when DR/CT* acquired.

HEDP Material, Component/Target	Scan Type	Date Acquired
Glass capsule in 50-mg/cm^3 SiO_2 foam	DR	April 13 & Aug 24
LoTRT	DR	April 15
Density gradient reservoir	DR/CT	May 25, June 1 & 8
1 & 5-mg/cm^3 aerogel	DR	May 26 & June 10
DDP	DR	June 17
SiO_2 aerogel ρ gradient	DR	July 1
Platinum foam	DR	Aug. 22

* Digital radiography/Computed Tomography

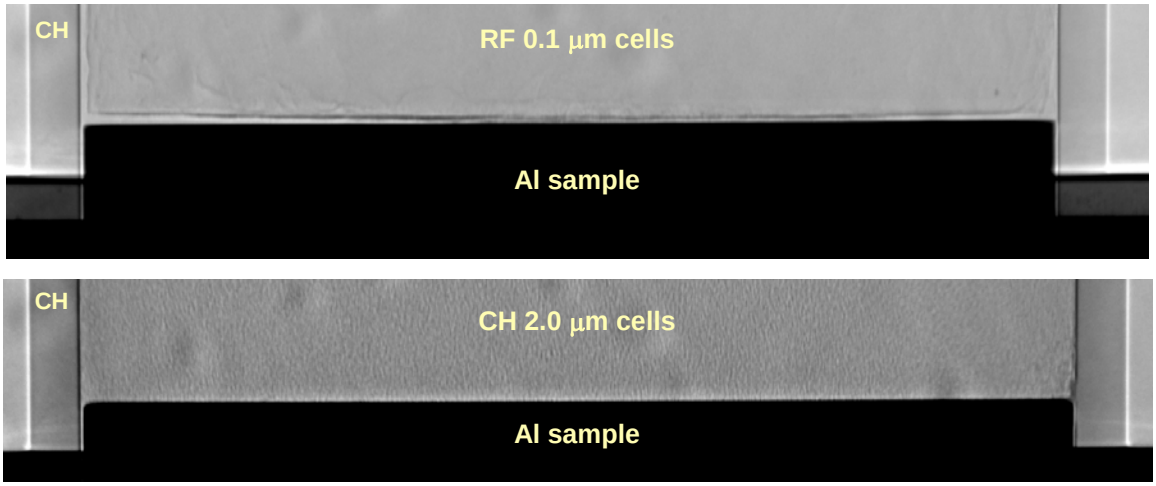

Figure 1 X-ray transmission (I/I_0) digital radiographs 0.55-μm pixel pitch at 0 degrees for two DDP targets. The grey scale is enhanced to highlight the interfaces. The interface between the Al sample and CH shock tube, and the payload is excellent for CH and good for RF.

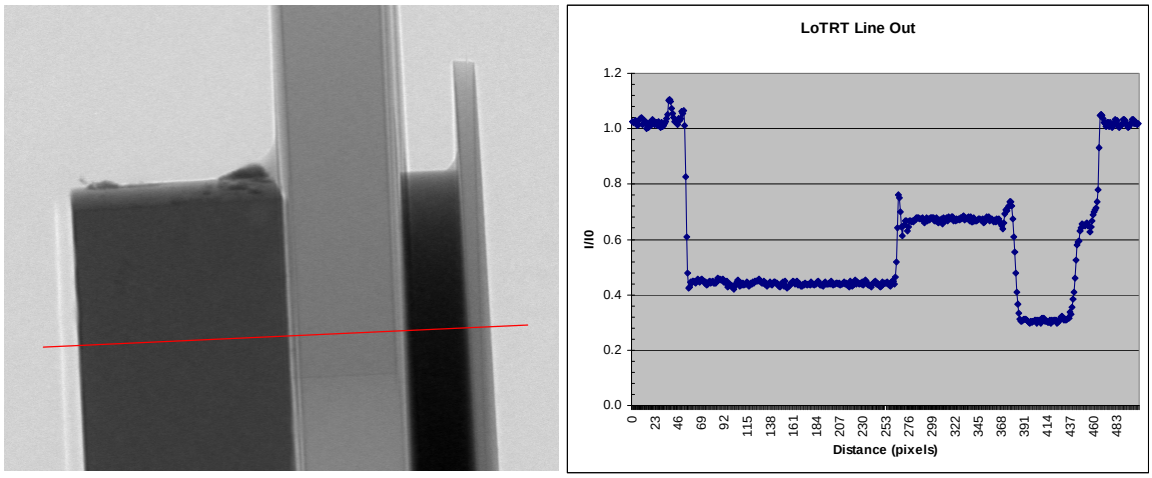

Figure 2 X-ray transmission (I/I_0) digital radiograph 2-μm pixel pitch at 90 degrees for a LoTRT target (left). A plot (right) of attenuation vs. distance for the line shown in the radiograph. This reveals a good assembled LoTRT target.

References

Brown, William, Harry Martz, John Sain and Kenn Morales, "X-ray Nondestructive Characterization of Mesoscale (mm extent with μm features) Objects," presented at Sixteenth Target Fabrication Specialist's Meeting, Scottsdale, Arizona, May 2, 2005, UCRL-PRES-#, Lawrence Livermore National Laboratory, Livermore, CA.

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